A REVIEW OF THE AMERICAN SPECIES OF THE GENUS SYNODUS.

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I have attempted in this paper to give a review of the American species of *Synodus*, with a detailed description of certain species imperfectly described elsewhere. The paper is based on specimens collected by Professor Jordan at Cedar Keys and Key West, Florida, and Havana, Cuba, belonging to the United States National Museum and the Museum of the Indiana University. All the Atlantic species here recognized, except *Synodus saurus*, are contained in this collection.

I am very much indebted to Professor Jordan for use of his library and for other aids.

Analysis of American Species of Synodus.

a. Snout short, obtuse, $3\frac{1}{2}$ in length of premaxillary; head somewhat compressed, much deeper than broad; anal fin comparatively long, its rays about 14; head $3\frac{2}{3}$ in length; origin of dorsal midway between snout and adipose fin; scales 4–55–6 (*Trachinocephalus* Gill). *myops.* 1.

aa. Snout long, pointed, about $2\frac{1}{2}$ in premaxillary; head depressed, little if any deeper than broad; anal comparatively short, rays 10 to 12; head 4 to $4\frac{2}{3}$ in length (*Synodus*).

b. Scales large, 43 to 50 in lateral line; origin of dorsal midway between tip of snout and adipose fin; lateral line with a blunt keel posteriorly.

c. First and last rays of dorsal coterminous when the fin is depressed; black blotch of scapula very small or obsolete; D. I–10; A. I–11 to 12; scales 4–45–5. *intermedius.* 2.

cc. Tips of first dorsal rays not reaching last when the fin is depressed; scapula with a large black blotch; D. I–11 to 12; A. I–10 to 11; scales 4–48–6. *anolis.* 3.

bb. Scales small, 55 to 70 in lateral line.

d. Dorsal fin much higher than long; tips of first rays extending beyond tips of last when the fin is depressed; length of fin $1\frac{3}{5}$ in length of longest ray, and $2\frac{1}{2}$ in head; teeth large; D. I–9; A. I–11; scales 4–57–6. *spixianus.* 4.

dd. Dorsal fin slightly higher than long; tips of first rays not extending beyond tips of last when the fin is depressed; teeth small.

e. Snout broader than long, the jaws subequal; tail with a slight keel; scales $3\frac{1}{2}$–60–6. *saurus.* 5.

ee. Snout longer than broad, the lower jaw included; tail without keel.

f. Four rows of scales between lateral line and adipose fin (6 in an oblique row); origin of dorsal fin nearer adipose fin than tip of snout; scales on cheeks in about 4 to 7 rows, on opercles in 4 to 5 rows.

g. Head very small, $4\frac{2}{5}$ in length; first rays of dorsal coterminous with last ray when the fin is depressed; cheeks with about 4 rows of large scales, opercles with about 4; ventrals $1\frac{1}{7}$ in head; pectoral 2 in head; D. I–10; A. I–12; scales 6–61–6. *scituliceps.* 6.

gg. Head 4 in length; tips of first rays of dorsal not reaching tips of last when the fin is depressed; scales on cheeks in about 7 rows, on opercles in about 5 rows; ventrals $2\frac{1}{3}$ in head; D. I–10 to 11; A. I–10 to 11; scales 4–64–6. *fœtens.* 7.

ff. Six rows of scales between adipose fin and lateral line; cheeks with about 9 rows of scales, opercles with about 8 rows; D. I–10; A. I–11; scales 13–66–16. *lucioceps.* 8.

Synodus myops.

Salmo myops Bloch & Schneider, Systema Ichthyol., 1801, 421 (St. Helena).

Saurus myops Cuvier & Valenciennes, Hist. Nat. Poiss., xxii, 1849, 485 (South Carolina, Martinique, Bahia, St. Helena); Günther, Cat. Fish. Brit. Mus., v, 1864, 398 (Cuba, Jamaica); Jordan & Gilbert, Syn. Fish. N. A., 1882, 281.

Trachinocephalus myops Poey, Syn. Pisc. Cub., 1868, 415 (Cuba).

Salmo fœtens Bloch., Ichthyologia, about 1790, taf. 384, fig. 2; Bloch & Schneider, Systema Ichthyol., 1801, 404 (not Linnæus).

Osmerus lemniscatus Lacépède, Hist. Nat. Poiss., v, 1803, 236 (on a drawing by Plumier).

Saurus truncatus Agassiz, Spix, Pisc. Bras., 1829, 82, tab. 45 (Brazil).

Saurus brevirostris Poey, Memorias Cuba, ii, 1860, 305 (Cuba).

Trachinocephalus brevirostris Poey, Syn. Pisc. Cub., 1868, 415 (Cuba); "anal rays 10;" Poey, Enum., 1875, 144.

Habitat.—Tropical Atlantic; Cuba; Jamaica; Martinique; Bahia; St. Helena; Brazil and South Carolina.

Head $3\frac{2}{3}$ in length of body; depth $5\frac{1}{2}$; D. I–10; A. I–14; scales 4–55–6 (transverse series counted vertically from dorsal fin to vent respectively).

Body little compressed; snout short, obtuse, $3\frac{1}{2}$ in premaxillary; mouth large, premaxillary $1\frac{2}{3}$ in head; interorbital area concave, about $6\frac{1}{2}$ in head, upper surface of head rugose. Dorsal slightly higher than long, its length $1\frac{1}{2}$ in head; origin of dorsal fin midway between tip of snout and adipose fin, slightly behind last rays of ventrals. Anal fin long, its base nearly equal to head; pectorals reaching root of ventrals, 2 in head; tips of ventrals almost reaching vent, ventrals $4\frac{1}{3}$ in length of body; caudal forked; teeth comparatively small; lower jaw slightly projecting. Color grayish, mottled with darker above; body with eleven cross-bars; a black blotch on scapula; a black streak extending from eyes around symphysis, forming a quadrated blotch on the side of each jaw, and one on the median line of each jaw; dorsal fin faintly barred; pectorals, ventrals and anal plain.

This description is taken from a very young specimen, twenty-three inches in length, collected by Professor Jordan in Havana. In the above synonymy we have omitted references from the Pacific Ocean, thinking it not impossible that the Asiatic species (*limbatus*) is a species distinct from *S. myops*. *Trachinocephalus brevirostris* Poey, known only from a drawing made in 1857, seems to differ only in the presence of ten instead of fifteen anal rays. This is probably an error, or perhaps an accidental mutilation. I have little doubt that it is a synonym of *S. myops*.

Synodus intermedius.

? ? ? *Synodus* Gronov., Mus. Ichth., ii, 1765, No. 151, tab. 7, fig. 1.

? ? ? *Esox synodus* Linnæus, Syst. Nat., i, 1766, 516 (America).

? ? ? *Synodus synodus* Bloch & Schneider, Systema Ichthyol., 1801, 396.

? *Saurus synodus* Cuv. & Val., Hist. Nat. Poiss., xxii, 1849 (Martinique; Guadeloupe; Bahia; St. Helena).

? ? ? *Synodus fasciatus* Lacépède, v, 1804, 321.

Saurus intermedius Agassiz, "Spix, Pisc. Brazil, 1829, 81, tab. 44 (Brazil)."

Synodus intermedius Poey, Enum. Pisc. Cub., 1875, 143 (Cuba, not of Synopsis).

Habitat.—Cuba; Brazil.

Head 4 in length of body; depth $6\frac{3}{4}$; D. I–10; A. I–10; scales 4–44–4 (transverse series counted from dorsal and vent respectively).

Body terete, rather robust; snout comparatively long and pointed, about $3\frac{3}{4}$ in head; mouth large; premaxillary about $1\frac{3}{4}$ in head; interorbital area concave, about $6\frac{1}{2}$ in head; supraorbital ridge present, terminating anteriorly before the nostrils.

Origin of dorsal fin midway between tip of snout and adipose fin; anterior rays of dorsal coterminous with posterior ones when the fin is deflexed; fin higher than long, its length about 2 in head, lower jaw slightly projecting; teeth moderate, anterior palatine teeth largest, becoming smaller posteriorly.

Lateral line with a blunt keel posteriorly, tips of ventrals reaching $\frac{3}{5}$ distance to vent, their length about $1\frac{1}{4}$ in head; tips of pectorals extending to roots of ventrals, $1\frac{4}{5}$ in head; caudal forked, lobes equal, scales large. Color yellowish above, lighter below, scales above lateral line punctulate with dark; breast flesh-colored; sides with a row of irregular black markings; scapula occasionally with a small black spot, faintly barred with black; caudal not barred, dusky; tips of middle rays darkest; other fins plain.

This description is taken from several specimens, the largest 5 inches in length, collected by Professor Jordan at Havana.

This is evidently the *Synodus intermedius* of Poey's Enumeratio. I have been unable to examine the figure of Agassiz and Spix, but from the account given of it by Poey, we infer that it is taken from specimens of the present species rather than of *S. cubanus*. According to Poey, the species figured by Spix lacks the scapular spot.

Synodus anolis.

[1] *Saurus anolis* Cuvier & Valenciennes, Hist. Nat. Poiss., xxii, 1849, 438 (Bahia; Martinique).

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[1] Since the above was in type the following notes have been received by Prof. Jordan from Dr. H. E. Sauvage, of the Museum of Paris: "*Saurus anolis* C. & V. Bahia. Type. Length of body 245 m. Lateral line with 54 scales; 10 in a transverse series. A well-marked black spot on the scapular part of the gill-openings." There seems to be no doubt of the identity of *anolis* and *cubanus*.

Saurus intermedius Günther, Cat. Fish. Brit. Mus., v, 1864, 396 (Jamaica; Demarara; Bahia; not of Agassiz).

Synodus intermedius Poey, Syn. Pisc. Cub., 1868, 414 (Cuba); Jordan & Gilbert, Syn. Fish. N. A., 1882, 889; Goode & Bean, Proc. U. S. Nat. Mus., 1882, 239 (name only); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 249 (Pensacola, Fla.).

Synodus cubanus Poey, Enum. Pisc. Cub., 1875, 143 (Cuba).

Habitat.—Atlantic shores of Tropical America; Pensacola; Key West; Cuba; Jamaica; Martinique; Demarara and Bahia.

The description of *Saurus anolis* is so insufficient, that no certain identification can be made.

This species has been sufficiently described by Jordan & Gilbert (Proc. U. S. Nat. Mus., 1882, 249). The large specimens from Key West, examined by me, agree well with this account.

Synodus spixianus.

Saurus spixianus Poey, Memorias Cuba, ii, 1860, 304 (Cuba).

Synodus spixianus Poey, Syn. Pisc. Cuba, 1868, 413 (Cuba); Poey, Enum. Pisc. Cub., 1875, 397 (Cuba).

Habitat.—Cuba; Key West.

Head $4\frac{1}{6}$ in length of body; D. I–9; A. I–11; scales 4–57–6 (transverse series counted from dorsal and vent respectively).

Body oblong, nearly terete; snout comparatively long and pointed, $3\frac{1}{2}$ in head and about $2\frac{1}{2}$ in premaxillary. Interorbital area concave, 6 in head. Eye 5 in head. Supraorbital striate. Branchiostegals 16. Origin of dorsal fin nearer adipose fin than tip of snout by length of dorsal fin; tips of anterior rays reaching beyond tips of posterior ones when the fin is deflexed; the fin is therefore much higher than long. Length of fin $1\frac{3}{5}$ in length of longest ray and $2\frac{1}{2}$ in head. Ventrals moderate, reaching about $\frac{3}{5}$ distance to vent, $1\frac{1}{3}$ in head. Tips of pectorals not reaching to roots of ventrals, about 2 in head. Adipose fin situated over middle of anal. Caudal forked, its lobes equal. Teeth larger than in the other species. Palatine teeth becoming smaller posteriorly. Color light sandy gray, much mottled above with darker olive. Branchiostegals very pale, yellowish. Ventrals and anal pale and plain, lower lobe of caudal dusky, neither barred. Dorsal faintly barred with darker olive.

This description taken from one specimen $8\frac{1}{2}$ inches long, collected by Professor Jordan in Havana. Numerous smaller ones from Key West have also been examined.

Synodus saurus.

Osmerus radiis pinnæ ani undecim Artedi, Descript. Spec. Pisc., 1738, 22 (Mediterranean).

Salmo saurus Linnæus, Syst. Nat., i, ed. 12, 1766, 511 (Europe).

Saurus lacerta Cuvier & Valenciennes, Hist. Nat. Poiss., xxii, 1849, 463 (Europe, not of Risso).

Synodus lacerta Goode, Bull. U. S. Nat. Mus., 1876, 68 (Bermudas).

Saurus griseus Lowe, Trans. Zool. Soc., ii, 1841, 188 (Madeira); Günther, Cat. Fish. Brit. Mus., v, 1864, 394 (Madeira, St. Vincent, Naples, Mediterranean).

I have not seen this species. Professor Goode (Bull. U. S. Nat. Mus., 1876, 68) makes the following reference to its occurrence in the Bermudas:—

"A specimen seventeen inches long was taken off the 'ducking-stool' in March, by a line fisherman. Its occurrence in this part of the Atlantic is very novel, but it agrees closely with a specimen of *Saurus griseus* sent to the United States National Museum by Dr. Günther. Its color was dusky gray above, yellow below. Its formulæ are as follows: Branchiostegals, 16–17 (on opposite sides); D. 12; A. 12; lateral line, 60; transverse line, $\frac{3\frac{1}{2}}{6}$."

Synodus scituliceps.

Synodus scituliceps Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 344 (Mazatlan); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 354 (Cape San Lucas); Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 106 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 109 (Panama).

Saurus fœtens Günther, Cat. Fish. Brit. Mus., 1864, 396 (in part; specimen from Panama).

Habitat.—Mazatlan, Panama.

Synodus fœtens.

Salmo fœtens Linnæus, Syst. Nat., i, ed. 12, 1766, 513 (Carolina).

Saurus fœtens Cuvier & Valenciennes, Hist. Nat. Poiss., xxii, 1849, 471 (Martinique, St. Domingo, Charleston, S. C.; Bahia, Rio Janeiro); Holbrook, Ichth. S. C., 1860, 187.

Synodus fœtens Gill, Rept. U. S. Fish. Com., 1871–2, 810 (name only); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 384 (Beaufort, N. C., no description); Goode, Proc. U. S. Nat. Mus., 1879, 119 (name only); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 342 (Key West); Bean, Proc. U. S. Nat. Mus., 1880, 105 (Beaufort, N. C.; no description); Goode & Bean, Proc. U. S. Nat. Mus., 1882, 239 (Gulf of Mexico); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 585 (Charleston, S. C.); Jordan & Gilbert, Syn. Fish. N. A., 1882, 280.

? *Coregonus ruber* Lacépède, v, 1804, 263 (on a drawing by Plumier).
? *Saurus longirostris* Agassiz, "Spix, Pisc. Bras., tab. 43, 1829" (Brazil).

Habitat.—Atlantic shores of America: Beaufort, Charleston, Cedar Keys, Key West, Martinique, St. Domingo, Rio Janeiro.

This is the most common species of the genus on the United States Coast. It is well described by Jordan & Gilbert, Syn. Fish N. A., 1882, 280.

Synodus lucioceps

Saurus lucioceps Ayres, Proc. Cal. Acad. Nat. Sci., 1855, 66 (San Francisco); Günther, Cat. Fish. Brit. Mus., v, 1864, 397 (copied).
Synodus lucioceps Jordan & Gilbert., Proc. U. S. Nat. Mus., 1880, 457 (San Francisco, Monterey Bay, Santa Barbara); Jordan & Jouy, Proc. U. S. Nat. Mus., 1881, 13 (San Francisco, Monterey, Santa Barbara); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 42; Jordan & Gilbert, Syn. Fishes N. A., 1882, 281.
Saurus fœtens Lockington, Ann. Mag. Nat. Hist., about 1878 (erroneously identified with the Atlantic species).

Habitat.—West Coast of U. S.: San Francisco, Monterey, Santa Barbara.

This species resembles *Synodus fœtens*, but has much smaller scales. This is shown especially when the number in vertical series is counted. The only accurate description is that of Jordan & Gilbert, Syn. Fish. N. A., 1882, 281.